

Natural history and two new species of the trapdoor spider genus *Conothele* Thorell 1878 (Araneae: Ctenizidae) from India

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Abstract. Two new species of the genus *Conothele* Thorell 1878 of the trapdoor spider family Ctenizidae are described from India: *Conothele giganticus*, sp. nov. is described from the Ngengpui Wildlife Sanctuary, Mizoram in northeast India and *C. khunthokhanbi* sp. nov. is described from Manipur in northeast India. Like other known Indian *Conothele* species, these spiders are also strictly ground burrowing. Additional information on habitat and natural history is provided for both species.

Keywords: Manipur, Mizoram, Mygalomorphae

The genus *Conothele* Thorell 1878 currently contains 18 species over the Oriental and Australian regions (Decae 2010; Platnick 2014). It is closely related to the genus *Ummidia* Thorell 1875 (Hedin & Bond 2006, Bond et al. 2012) from which it differs only in characters of undetermined generic significance (Main 1997; Siliwal et al. 2009; Opatova et al. 2013). With better sampling across their distribution ranges and the incorporation of molecular tools, we will better understand the validity of the two genera (Opatova et al. 2013). The different species of *Conothele* vary in body size, burrowing habit (arboreal or ground burrowing), and behavior (modifications in burrow structure) (Pocock 1900; Gravely 1935; Siliwal et al. 2009). This could be an adaptation to the local habitat.

So far, only two Indian *Conothele* species have been described (Siliwal et al. 2009). Here, we report on the discovery of two additional new species from Mizoram and Manipur, based on female specimens, and provide basic natural history information for the species from Mizoram. In this group of spiders, females have shown a distinct spermathecae structure with no variation that proves to be a useful character in species identification in the absence of the male. In contrast to previous reports of them being arboreal (Pocock 1900; Gravely 1935), all known Indian species of *Conothele* are ground burrowing.

METHODS

The specimens are deposited at the museum collection of the Wildlife Information Liaison Development Society, Coimbatore, Tamil Nadu. Measurements of body parts except for eyes were taken with a Mitutoyo™ Vernier Caliper. Eye measurements were made with a calibrated ocular micrometer. All measurements are in mm and are accurate to ± 0.02. Spermathecae were dissected and cleared in concentrated lactic acid. All illustrations were prepared with the help of a camera lucida attached to a MOTIC™ stereomicroscope by MS.

Abbreviations: ALE = anterior lateral eye, AME = anterior median eye, MOA = median ocular area, PLE = posterior lateral eye, PLS = posterior lateral spinnerets, PME = posterior median eye, PMS = posterior median spinnerets, PER = posterior eye row, WILD = Wildlife Information Liaison Development Society. Abbreviations used for hair and spines count are d = dorsal, fe = femur, mt = metatarsus, p = prolateral, pa = patella, r = retrolateral, ta = tarsus, ti = tibia, v = ventral.

TAXONOMY

Family Ctenizidae Thorell 1887 Genus *Conothele* Thorell 1878

Remarks.—As with other ctenizids, the females have three claws and lack scopula and claw tufts.

KEY TO FEMALES OF *CONOTHELE* SPECIES OF INDIA

1. Eye group about as wide posteriorly as anteriorly and at least twice as wide as long 2
 Eye group clearly narrower posteriorly and only about 1.5 times wider than long . . . *C. varvarti* Siliwal, Nair, Molur and Raven
2. Females with carapace length of 5–6mm and with spines distally on prolateral tibia III either weak or absent 3
 Females with carapace length of 10–13mm and strong spines distally on prolateral tibia III (Fig. 1F) *C. giganticus* sp. nov.
3. Eye group twice as wide as long and cuspules on maxillae in one group *C. vali* Siliwal, Nair, Molur and Raven
 Eye group clearly more than twice as wide as long and cuspules on maxillae in two groups *C. khunthokhanbi* sp. nov.

Conothele giganticus Siliwal and Raven new species
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(Figs. 1A–H, 2A–C)

Type specimens.—INDIA: Mizoram: Holotype female, Ngengpui Wildlife Sanctuary, Mizoram, elev. 217 m,

22.51691° N, 92.77319° E, 12 October 2012, Manju Siliwal (WILD-12-ARA-1162); paratypes 2 females, same data as holotype, 13 March 2013, Manju Siliwal and Keshab Gogoi (WILD-13-ARA-1207, 1208).

Diagnosis.—*Conothele giganticus* new species differs from other known species of this genus from India and Myanmar by the very large body, almost double the size of other known

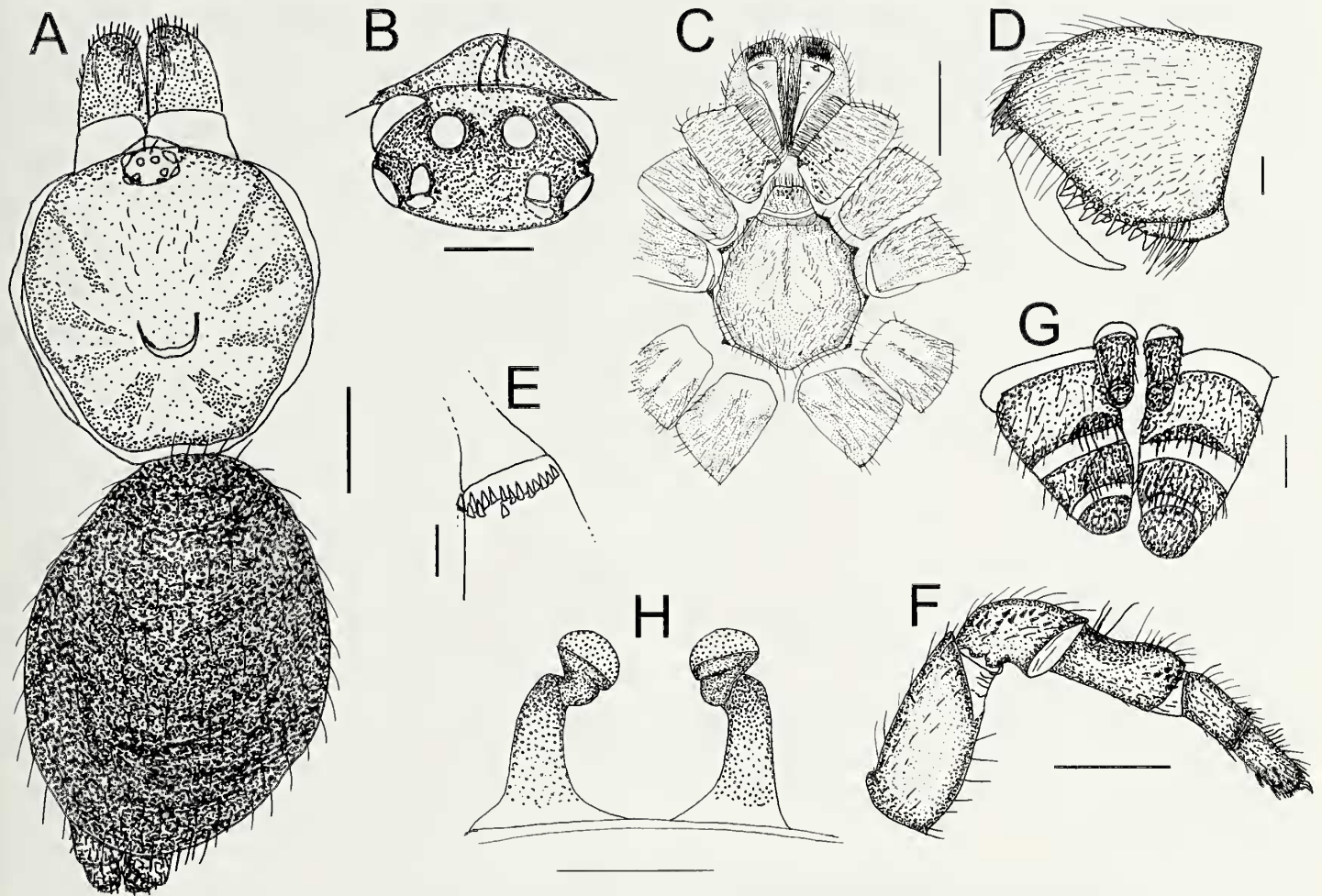


Figure 1.—*Conothele giganticus* new species, female (WILD-12-ARA-1162). A, Carapace and abdomen, dorsal view; B, Eyes; C, Sternum, maxillae, labium, chelicerae; D, Chelicerae, prolateral view; E, Chelicerae, rastellum spines, lateral view; F, Leg III (Fe to Ta) prolateral view; G, Spinnerets, ventral view; H, Spermathecae. Scale 1.0 mm for B, D, E, G, H and scale 5.0 mm for A, C, F.

species of Indian *Conothele*; carapace distinctly longer than patella and tibia of leg I and IV (in *C. vali* Siliwal, Nair, Molur & Raven 2009, carapace shorter than patella plus tibia of leg I and IV); by the anterior and posterior eye groups about equally wide (eye group clearly narrower posterior in *C. varvarti* Siliwal, Nair, Molur & Raven 2009) and together at least twice as long (about 1.5 times in *C. varvarti* and *C. vali*; more than twice in *C. khunthokhanbi* new species); strongly spined on distal prolateral face of tibia III (absent in *C. khunthokhanbi* new species, 2–3 spines in *C. varvarti* and *C. vali*); spermathecae with globular apical lobe facing up, each stalk broader at the base, distally gradually narrowing down and at the base of lobe stalk is sclerotized and partially bent in zigzag pattern.

Etymology.—The species epithet is derived from Latin word for “large,” referring to the putatively diagnostic larger size of spider compared to other species of *Conothele* described from India and Myanmar.

Description Holotype female.—Total length, 31.32; carapace 13.42 long, 12.99 wide. Abdomen 17.90 long, 13.14 wide. Spinnerets: PMS, 1.18 long, 0.85 wide, 0.16 apart; PLS, 2.99 total length (1.74 basal, 0.86 middle, 0.39 distal; midwidths 2.45, 1.91, 1.33 respectively). Morphometry of legs and palp are given in Table 1.

Color in life: Complete spider black (Fig. 2C).

Color in alcohol: Carapace reddish-brown, darker near fovea, striae and margins. Sternum orangish-brown, darker anteriorly and on margins. Labium, coxae, maxillae reddish-brown. Chelicerae blackish-brown dorsally. Abdomen grayish-black, dorsally with scattered small yellowish spots radiating in curved line; ventrally, integument appears wrinkled with paler or yellowish furrows.

Carapace: Glabrous except for 17 long bristles on caput, few short on thoracic region along striae, three between anterior eyes (Fig. 1A), weak crenulations on caput, more conspicuous near eye, caput. Caput with distinct mound between fovea and eyes. Fovea deep, procurved, U-shaped (Fig. 1A).

Eyes (Fig. 1B): Eight in two rows on distinct ocular tubercle, both rows procurved, posterior row slightly procurved, ocular group 1.26 long, 2.52 wide, ~ 0.28 of head width; MOA, 1.40 anterior width, 1.62 posterior width, 1.05 long. AME 0.41, PME 0.36, ALE 0.69, PLE 0.43; distance between ALE-AME 0.16, AME-AME 0.16, PLE-PME adjacent, PME-PME 1.08, ALE-PLE 0.08; clypeus, very narrow or absent, chilum distinct, triangular.

Maxillae (Fig. 1C): 3.94 long anterior, 5.68 long posterior, 3.24 wide; 25 cuspules 2–3 irregular short rows on prolateral-

Table 1.—Morphometry of legs and palp of the holotype female (WILD-12-ARA-1162) and paratype female (WILD-13-ARA-1208) of *Conothele giganticus* new species.

	Leg I		Leg II		Leg III		Leg IV		Palp	
	Holo	Para	Holo	Para	Holo	Para	Holo	Para	Holo	Para
	#1162	#1208	#1162	#1208	#1162	#1208	#1162	#1208	#1162	#1208
	Lengths (mm)									
Femur	8.48	6.57	7.14	5.23	7.25	5.64	9.43	7.76	8.58	6.92
Patella	5.99	4.36	5.38	3.66	5.46	3.61	5.58	3.68	5.2	3.49
Tibia	5.55	4.37	4.2	2.96	4.75	2.76	5.78	4.56	5.67	4.57
Metatarsus	3.71	2.55	3.4	2.01	3.56	2.26	5.86	4.09	-	-
Tarsus	2.39	1.37	2.49	1.44	3.59	2.55	3.84	2.02	4.47	3.29
Total	26.12	19.22	22.61	15.3	24.61	16.82	30.49	22.11	23.92	18.27
	Midwidths (mm)									
Femur	2.38	2.24	2.33	2.24	2.58	2.51	2.52	2.17	2.01	2.26
Tibia	2.55	1.47	2.47	1.57	3.34	1.86	2.84	1.72	2.38	1.27

proximal corner, half length of maxillae. Anterior lobe greatly reduced.

Labium (Fig. 1C): 2.03 long, 2.66 wide, labiosternal groove shallow, straight with procurved ends, 10 large cuspules in two rows (6+4) centrally, size of cuspules similar to that on maxillae.

Chelicerae (Figs. 1D, E): 6.95 long; 11 large promarginal teeth, 9 large and 1 very small retromarginal teeth, basomesal teeth absent; rastellum conspicuous, raised on low mound, consist of 14 thick spines on vertical face and up, 10 of which make up anterior row; many long and short bristles present along anterior dorsal surface.

Sternum (Fig. 1C): broader between coxae III–IV, orangish-brown, elevated towards margins, sloping posteriorly, 7.60 long, 7.46 wide, covered with long black bristles, more dense towards lateral sides, posterior angle blunt and not separating coxae IV. Sigilla large, irregularly shaped centrally placed. Non-sigillate area with fine corrugations.

Legs: III–IV thicker than I–II. Tibiae, metatarsi, and tarsi of I–II and tibiae and tarsi of palp dorsoventrally flattened. Femora III clearly wider than the rest. Tibiae III with saddle-shape depression on lower basal half (Fig. 1F). Metatarsi III shorter than tarsi III. Legs covered with sparsely distributed

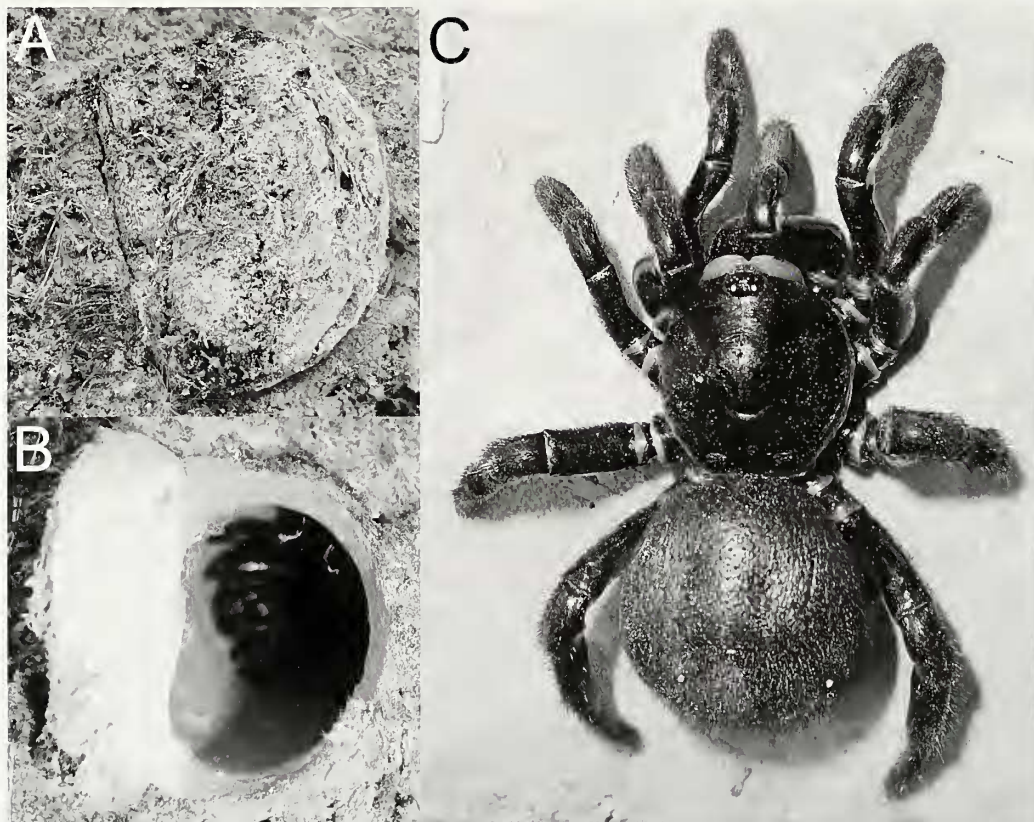


Figure 2.—*Conothele giganticus* new species, female (WILD-12-ARA-1162). A, Burrow closed; B, Burrow open; C, spider in life.

hair, bristles, curved and normal thick thorn-like spines. Two conspicuous hairless bands running over length of femora, patellae, and tibiae. Apophysis on dorsal trochanter III present. Leg formula 4132.

Spines: curved thick thorn-like spines on legs I–II and palp, rest normal spines. I: ti p = 76, r = 70, mt p = 66, r = 42, ta p = 29, r = 13; II: ti p = 50, r = 26, mt p = 46, r = 13, ta p = 30, r = 9; III: pa p = 14, ti p = 5, mt p = v = 4, r = 3, ta p = 18, r = 5; IV: mt p = 4, ta p = 19, r = 4; palp: pa v = 1, ti p = 82, r = 74, ta p = 70, r = 62.

Trichobothria: ti I–IV, 14–20 in four rows on lateral side amongst spines; mt I–IV with 16–26 filiform trichobothria in four rows for length; ta I with 3 clavate trichobothria basal, 20–24 filiform in multiple longitudinal rows; ta II with 6 clavate in basal, 20–24 filiform in two longitudinal rows; ta III with 3 clavate in basal one fourth, 11 filiform in multiple longitudinal rows; ta IV with 4 clavate basal, 9 filiform in two rows in distal half; palp, ti with 6 (rest broken) filiform in two curved rows; ta with 6 clavate in center, 8 filiform in 2 longitudinal rows.

Leg coxae: coxae IV clearly wider than rest, I clearly longer than rest, II and III subequal. Covered with black bristle-like hair; hairless or glabrous bands more prominent on III–IV; small spot on basal area of I–II, distinct two glabrous bands for length on III, three glabrous bands in basal two third on IV.

Claws: paired claws on legs III–IV with unequal bifid tooth and slightly larger than on I–II each with one tooth. Palpal claw with one tooth.

Abdomen: grayish-brown, with few small yellow spots radiating in curved line, covered with short and long black bristles on tubercles, giving warty appearance; one in 7–8 bristle is long and about 2–3 times longer and slightly thicker than short bristles. Ventrally, uniformly covered with short and long bristles.

Spinnerets: PMS digitiform covered with black hair; PLS, covered with black hair, apical segment dome-shape (Fig. 1G), ventrally with band of spigots (two types), basal segment with short band on distal edge, middle segment with long band for length, apical segment with hairs only on periphery, rest covered with spigots.

Spermathecae (Fig. 1H): paired lobes, each stalk broader at base, gradually narrowing distally with globular apical swollen lobe, upwards-facing stalk is sclerotized and partially bent in zigzag pattern at base of lobe.

Paratype female (WILD-13-ARA-1208).—Total length 23.70; carapace 10.78 long 9.70 wide; chelicerae 4.85 long intact, 9 large and 3 very small retromarginal and 9 large and 2 small promarginal teeth. Sternum 5.24 long, 5.10 wide. Labium 1.55 long, 1.35 wide, 11 large cuspules. Maxillae 2.45 long anteriorly, 4.29 long posteriorly, 1.97 wide, 22 cuspules. Abdomen 12.92 long and 9.29 wide. Spinnerets: PMS, 0.95 long, 0.46 wide, 0.15 apart; PLS, 1.04 total length (1.04 basal, 0.35 middle, 0.1 distal; midwidths 1.44, 1.29, 0.41 respectively). Spines: I: pa v = 1; ti p = 58, r = 63, mt p = 49, r = 38, ta p = 28, r = 15; II: ti p = 39, r = 17, mt p = 39, r = 8, ta p = 26, r = 7; III: pa p = 13, ti p = 5, mt d = 6, p = 5; ta p = 17, r = 3; IV: ti v = 2 (only on one leg), mt p = 6, ta p = 18, r = 4; palp: pa v = 1–2, ti p = 66, r = 69, ta p = 52, r = 53. Morphometry of leg and palp is given in Table 1. Rest of the characters are same as holotype (WILD-12-ARA-1162).

Distribution.—India, Mizoram: Ngengpui, Mampui in Lawngtlai district.

NATURAL HISTORY

This species (Fig. 2C) was found alongside road cuts in Mampui and Ngengpui Wildlife Sanctuary and we presume it occurs in all the forested area surrounding these two localities. Burrows were difficult to locate as they were highly camouflaged and in dense undergrowth. Burrows were relatively easier to find during the dry season than in the wet season. We could locate only eight burrows, of which only three were inhabited. Abandoned burrows had the trapdoor lid open and were hinged at the side. Burrows were simple, short (55–80 mm), tube-like, wider at the base and with D-shape trapdoor lid closing the entrance (Fig. 2A). The trapdoor lid was thick and cork-like, as seen in other members of this family, the door hinge was always on the sides of the entrance but none were seen at the top or bottom (Fig. 2B). The outer side of the lid was covered with soil, moss, and debris while the inner side of the lid had silk knitted parallel to the lid hinge and fang marks were evident. During the dry season, an additional rim of silk was attached to the periphery of the lid as well as to the burrow entrance to ensure a tighter fit, presumably to help better maintain optimum temperature and humidity inside the burrow. Gravid females were collected during March, which indicated that these spiders nest during summer.

Burrows were found on road-side cuts on forest paths from 0.25 m to 2.5 m height, perpendicular to the angle of the slope of roadside cuts. They were close to the ground and higher up to 1.5 m, both in open and closed canopy areas. Burrows ranged between 20 × 15 mm to 35 × 27 mm diameter about 55–80 mm deep with lid thickness ranging from 4–6 mm. The habitat was evergreen forest in a wide elevation range from 100–800 m and the spider seemed to prefer areas with moderate to high canopy cover (< 50%) in a non-rocky area. We were able to locate them only in areas with less ground vegetation (2–15%).

Conothele khunthokhanbi Kananbala, Bhubaneshwari and Siliwal new species

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(Figs. 3A–F)

Type specimen.—INDIA: Manipur: holotype female, Kwa-keithel, District Imphal, 14 October 2010, Akham Kananbala and M. Bhubaneshwari (WILD-10-ARA-542).

Diagnosis.—*Conothele khunthokhanbi* new species differs from other known *Conothele* species by the eye group with eyes set about as wide posteriorly as anteriorly (eye group clearly narrower posteriorly in *C. varvarti*) and more than twice as wide as long (about 1.5 times in *C. varvarti* and *C. vali*; twice in *C. giganticus* new species); spines absent on tibia III (spines present in *C. giganticus* new species, *C. varvarti* and *C. vali*); carapace distinctly longer than patella and tibia of leg I and IV as in *C. giganticus* new species (in *C. vali*, carapace shorter than patella and tibia of leg I and IV); cuspules on maxillae in two groups, one group in posterior basal half and second group in anterior lobe (one group in prolateral-proximal corner covering three fourths of maxillae length in *C. vali*, *C. varvarti*); spermathecae with globular apical lobe facing up, each stalk straight without any bend (Fig. 3F).

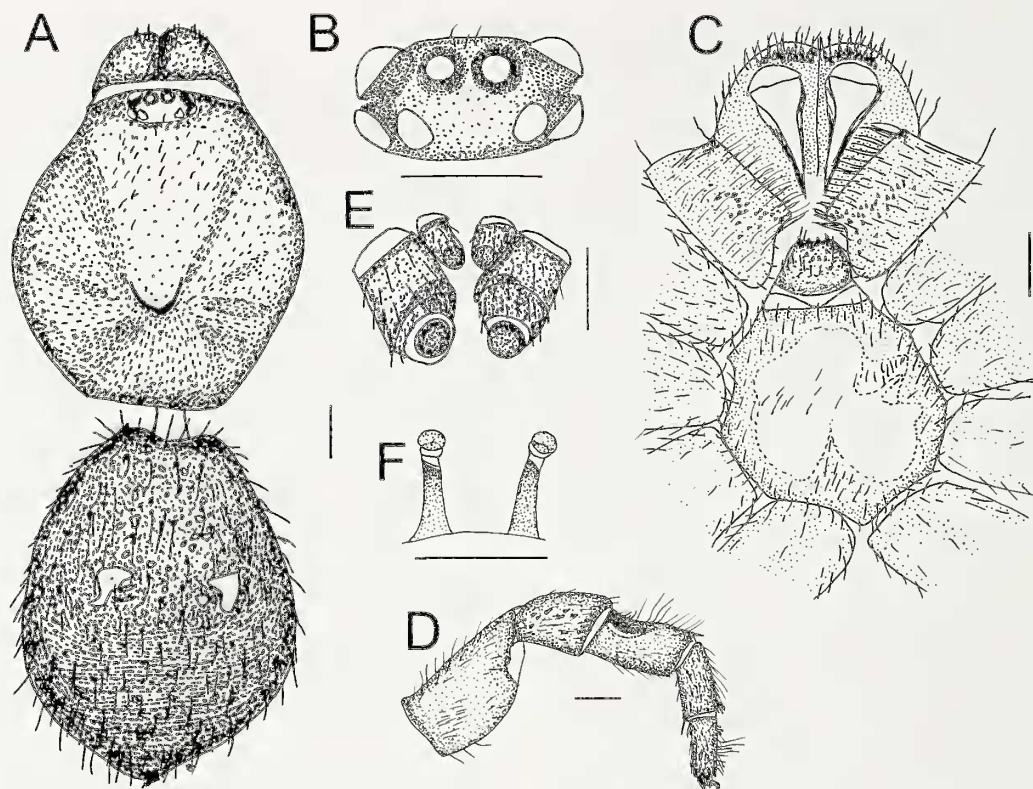


Figure 3.—*Conothele khunthokhanbi* new species, female (WILD-12-ARA-1162). A, Carapace and abdomen, dorsal view; B, Eyes; C, Sternum, maxillae, labium, chelicerae; D, Leg III (Ti to Ta) prolateral view, I; E, Spinnerets, ventral view; F, Spermathecae. Scale 1.0 mm for A–F.

Etymology.—The species epithet is a noun in apposition for the local goddess Khunthokhanbi in Manipur.

Description holotype female.—Total length, 14.26; carapace 6.74 long, 6.07 wide. Abdomen 7.52 long, 5.76 wide. Spinnerets: PMS, 0.63 long, 0.30 wide, 0.21 apart; PLS, 2.99 total length (0.70 basal, 0.18 middle, 0.10 distal; midwidths 0.97, 0.62, 0.50 respectively). Morphometry of legs and palp is given in Table 2.

Color in alcohol: Carapace, legs, chelicerae, reddish-brown, posterior legs lighter than anterior legs. Sternum yellowish-brown, labium, coxae, maxillae greenish-brown; abdomen, grayish-brown; dorsally with scattered small pale spots radiating in curved line; ventrally, integument yellowish with few black patches.

Carapace: Glabrous with few bristles on caput and ocular area. Bristles: *ca.* 50 small on caput and 2 small on clypeus edge. Weak crenulations on caput, more conspicuous near eyes, and caput. Caput with distinct mound between fovea and eyes. Fovea deep, procurved, U-shaped (Fig. 3A).

Eyes (Fig. 3B): Eight in two rows on low ocular tubercle, both rows straight, clypeus absent. Ocular group 0.60 long, 1.42 wide; MOA 0.70 anterior width, 0.97 posterior width, 0.56 long. AME 0.21, PME 0.19, ALE 0.29, PLE 0.26; distance between ALE-AME 0.14, AME-AME 0.09, PME-PME 0.51, ALE-PLE and PLE-PME adjacent; clypeus absent or very narrow, chilum distinct, triangular.

Maxillae (Fig. 3C): 1.86 long in anterior, 2.31 long posterior, 1.27 wide; cuspules in two groups, first group of 24–25 cuspules 2–3 evenly spread curved rows on prolateral-proximal corner for two-thirds length of basal maxillae and

another small group of 7–8 cuspules on anterior-distal corner (anterior lobe area). Anterior lobe indistinct.

Labium (Fig. 3C): 0.90 long, 1.20 wide, labiosternal groove shallow, straight with procurved ends with two labiosternal sigilla on either end of groove, 9 large cuspules in two curved rows (5+4) centrally, size of cuspules similar to that on maxillae.

Chelicerae (Fig. 3C): 3.24 long; 4 large and one small promarginal teeth, 8 large retromarginal teeth, basomesal teeth absent; rastellum conspicuous, raised on low mound, consists of 25 thick spines on vertical face and up, of which, 11 in anterior row; many long and short spines along anterior dorsal surface.

Sternum (Fig. 3C): 3.69 long, 3.36 wide, elevated towards margins, sloping posteriorly, broader between coxae III;

Table 2.—Morphometry of legs and palp of holotype female (WILD-10-ARA-542) of *Conothele khunthokhanbi* new species.

	Leg I	Leg II	Leg III	Leg IV	Palp
	Lengths (mm)				
Femur	3.96	3.5	3.29	4.23	3.87
Patella	2.58	2.55	2.22	2.85	2.36
Tibia	2.5	2.16	2.1	2.41	2.24
Metatarsus	1.96	1.41	1.15	2.7	-
Tarsus	1.15	1.42	1.44	1.77	2.38
Total	12.15	11.04	10.2	13.96	10.85
	Midwidths (mm)				
Femur	1.23	1.1	1.66	1.1	0.85
Tibia	1.27	1.02	1.23	1.16	1.19

covered with long black bristles, row of long bristles on margins, posterior angle blunt and not separating coxae IV. Sigilla large, irregular shape, centrally placed, covering most of sternum. Non-sigillate area with fine corrugations.

Legs: III–IV thicker than I–II. Tibiae, metatarsi and tarsi of I–II and tibiae and tarsi of palp dorsoventrally flattened. Femora III clearly wider than the rest. Tibiae III with saddle-shaped depression on lower basal half (Fig. 3D). Metatarsi III shorter than tarsi III. Legs covered with sparsely distributed hair, bristles, normal and curved thick thorn-like spines. Two conspicuous hairless bands for length of femora, patellae and tibiae. Apophysis on dorsal trochanter III present. Leg formula 4123.

Spines: curved thick thorn-like spines on legs I–II and palp, rest normal spines. I: ti p = 60, r = 65, mt p = 44, r = 34, ta p = 31, r = 26; II: ti p = 45, r = 11, mt p = 44, r = 13, ta p = 43, r = 13; III: pa p = 11, mt d = 4, v = 1, r = 5, ta p = 16, r = 3; IV: mt p = 3, d = r = v = 1, ta p = 13, r = 4; palp: pa p = 2, ti p = 54, r = 55, ta p = 52, r = 56.

Trichobothria: Ta I 4 clavate, 8 filiform for length; ta II 4 clavate, 8 filiform for length; ta III 6 clavate, 10 filiform in distal two thirds; ta IV, 7 clavate, 12 filiform in two rows in distal three quarters; palp, ta 9 clavate in center, 4 filiform in distal two thirds. Clavate only in basal area on all tarsi.

Leg coxae: Coxae IV clearly wider than rest, I clearly longer than rest, II and III subequal. Covered with black bristle-like hairs; hairless or glabrous bands more prominent on III–IV; small spot on basal area of II, distinct two glabrous bands for length on III, three glabrous bands in basal two thirds on IV.

Claws: paired claws on legs III–IV with unequal bifid tooth and slightly bigger than on I–II, each with single tooth. Palpal claw with single bifid tooth.

Abdomen: grayish-brown, with few yellow small spots radiating in curved line, covered with short and long black bristles on tubercles, giving warty appearance; one in each 6–7 bristles is long and about 2–3 times longer and slightly thicker than short bristles. Ventrally, uniformly covered with short and long bristles.

Spinnerets (Fig. 3E): PMS digitiform, covered with black hair; PLS covered with black hair, apical segment domed, ventrally with band of spigots (two types), basal segment with short band on distal edge, middle segment with long band for length, apical segment with hairs only on periphery, rest covered with spigots.

Spermathecae (Fig. 3F): paired lobes, each stalk, straight, slightly broader towards base, distally gradually narrowing down with globular apical swollen lobe, at base of lobe, stalk with sclerotized ring twisted band.

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